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Marine Casualty Investigations

Enquêtes sur les accidents maritimes

INVESTIGATION REPORT INTO THE CIRCUMSTANCES ATTENDING THE NEAR-CAPSIZING AND THE GROUNDING OF THE US TUG "MAGIC" WHILST TOWING THE BARGE "CMS 1261" IN THE WEST END OF LAKE SAINT-PIERRE ON JUNE 2, 1986.

REPORT No. 466

Investigation Report to the Minister pursuant to sections 542 or 545 of the Canada Shipping Act

Rapport d'investigation au Ministre conformément aux articles 542 ou 545 de la Loi sur la marine marchande du Canada

Canada

Ce rapport est aussi disponible en français.

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INVESTIGATION REPORT INTO THE CIRCUMSTANCES ATTENDING THE NEAR-CAPSIZING AND THE GROUNDING OF THE US TUG "MAGIC" WHILST TOWING THE BARGE "CMS 1261" IN THE WEST END OF LAKE SAINT-PIERRE ON JUNE 2, 1986.

Particulars of Tug

Name	"MAGIC"
Official Number	502232
Port of Registry	Philadelphia, USA
Call Sign	WX 6809
Gross Tonnage	146
Net Tonnage	99
Length	26.21 m (86 ft)
Breadth	8.23 m (27 ft)
Depth	2.77 m (9.1 ft)
Draught (at time of incident)	F: 2.29 m (7.5 ft) A: 3.81 m (12.5 ft)
Type	Tug
Built	1966, Houma, LA, USA. Steel construction.
Propulsion	Two (2) twelve (12) cylinder Caterpillar diesel engines of 900 b.h.p. each driving two (2) fixed pitch propellers. Engines controlled from bridge.
Rudders	Two (2)
Speed without tow	12-13 knots
Crew (at time of incident)	Eight (8) persons including two two (2) pilots
Owners	Tug Magic Company Wallingford, PA, USA
Charterers	Calore Freight Systems Seekonk, MA, USA

Navigating Equipment

Radar	Two (2) Furuno FR-240 MII
Loran C	Micrologic ML-200
VHF 1	Texas Instrument
VHF 2	Apelco
Gyro Compass	Anschutz
Magnetic Compass	E.S. Ritchie Inc.

Particulars of Barge

Name	"CMS 1261"
Official Number	613322
Port of Registry	New Orleans, LA, USA
Gross Tonnage	2,607
Net Tonnage	2,607
Length	79.25 m (260 ft)
Breadth	21.97 m (72.1 ft)
Depth	4.72 m (15.5 ft)
Draught (at time of incident)	Same forward and aft 1.68 m (5.5 ft)
Type	Flush deck steel barge
Built	1979, Braithwaite, LA, USA. Steel construction
Propulsion	None
Cargo	Twelve (12) Pontoons. Total weight 900 tonnes.
Crew	None
Classification	ABS

Owners	Central Barge Company New Orleans, LA, USA
Charterers	Calore Freight Systems Seakonk, MA, USA

Note: 1. A glossary of abbreviations and terms can be found following the Findings in this report.

2. All times in this report are expressed in Eastern Daylight Saving Time (UTC minus 4 hours.)

Background

At 0930 on June 2, 1986, whilst the US tug "MAGIC" and her tow, the US barge "CMS 1261", were downbound in the St. Lawrence River on the Île des Barques range at the west end of Lake Saint-Pierre, the "MAGIC" suddenly listed heavily, about 30°, to starboard.

Attempts at righting the tug by manoeuvring the engines and by turning the rudders from port to starboard proved unsuccessful. The towing winch was disengaged so that the towrope could pay out freely and the tug was then steered towards the barge. Once made fast to the barge, three (3) crew members and the two (2) pilots abandoned the listing tug by jumping onto the barge.

As the "MAGIC" was being made fast to the barge both vessels were pushed outside the channel by a strong north-north-east wind. The "MAGIC" touched bottom, stopped and righted herself about 183 m (600 ft) south of buoy S111. When the "MAGIC" grounded, the mooring lines made fast to the barge parted and the barge drifted away before she herself ran aground about 366 m (1,200 ft) south of buoy S111.

At 1045 on the same day the "MAGIC" refloated by herself and was brought to the port of Sorel for an inspection to the hull, whereas the "CMS 1261" was refloated two days later, i.e. on June 4 at about 1640. There were no injuries or pollution, nor was there any apparent damage to the "MAGIC" or to the barge as a result of this accident.

Narrative

On May 20, 1986, the "MAGIC" with four (4) crew members aboard sailed from Philadelphia bound for the Great

Lakes where the US barge "CMS 1261" with a load of twelve (12) steel pontoons was waiting for her. The barge was to be towed to San Diego, California, via the Panama Canal.

On May 26, the "MAGIC" made a stop at Quebec City where her master was advised by the charterers that the "CMS 1261" would be waiting at the designated rendez-vous point in Lake Erie and that he should top up his fuel tanks at Ogdensburg, N.Y.

On the morning of May 28, 1986, the "MAGIC" berthed in Ogdensburg and took on board 56,800 L (15,000 US gallons) of diesel oil. She sailed from Ogdensburg in the afternoon bound for the Welland Canal and arrived there on May 29, 1986, at about 1115.

The upbound transit through the Welland Canal by the "MAGIC" was uneventful and at about 0030 on May 30 she arrived at the rendez-vous point with the barge which was waiting 1.5 miles west of Port Colborne, Lake Erie.

The barge was then taken in tow by the US tug "MAGIC" and the Canadian tug "LAC COMO". The tow arrived at Port Colborne where an inspection was carried out by St. Lawrence Seaway officials in preparation for towing through the Welland Canal.

At about 0800 on May 30, the barge left Port Colborne downbound through the Welland Canal, towed by the "LAC COMO" and pushed by the "MAGIC". On leaving the Welland Canal at about 1700, the positions of the tugs were reversed for the voyage across Lake Ontario.

At 1030 on May 31, 1986, the tow rounded Cape Vincent and at 2020 stopped at Prescott for a crew change on the "MAGIC" involving the chief engineer, a deck officer and one (1) seaman/cook.

On June 1, 1986, at about 0600 the tow sailed from Prescott with six (6) crew members aboard the "MAGIC", i.e. one (1) master, one (1) chief officer, one (1) deck officer, two (2) engineers and one (1) seaman/cook. At about 0740 the tow went through Iroquois Lock and by 0330 on June 2 the tow arrived at Saint-Lambert Lock.

On departing Saint-Lambert Lock, the barge was moored to the approach wall. At 0410, the "MAGIC" with the barge in tow left the wall and, at the request of Seaway officials, the "LAC COMO" remained secured to the stern of the barge until downstream of the Jacques-Cartier bridge. Downriver

from the bridge, the "LAC COMO" disengaged herself from the tow. The two (2) pilots who were on board the "MAGIC" requested that the master lengthen the tow to about 45.72 m (150 ft).

The downbound trip proceeded normally and was uneventful. The two pilots from district 1, i.e. between Montreal and Trois-Rivières, took their turn piloting the "MAGIC" in the presence of the officer on watch.

A little before 0800, the chief officer while standing watch noticed a slight list to starboard. At 0800 he was relieved by the master and left the bridge.

At about 0800, the "MAGIC" reported her position at Calling In Point No. 22 at Tracy to the Montreal VTS Centre and by 0900 the tug was abeam of Île des Barques. The engines were running 'full ahead' and the tug was averaging a speed of about 10 knots over the ground.

Meanwhile, off Sorel, the first pilot who had been piloting the "MAGIC" was relieved by the second pilot.

At Île des Barques, there was a north-north-easterly wind of 20 to 25 knots causing the "MAGIC" to pitch moderately through waves estimated to be 1.5 m (5 ft) high.

Near buoy S113, the Île des Barques range was in transit astern. The tug was on autopilot and a course change was effected by the second pilot who sat in front of the autopilot control, however, because of the state of the sea it was difficult to steer with the autopilot. The master was also in the wheel-house and was sitting to the right of the second pilot. The rest of the crew as well as the first pilot were in the crew's quarters.

In the wheel-house, the master and the second pilot noticed a starboard list. The master rose, opened the door on the starboard side and noticed that the afterdeck was under water. In an attempt to bring the tug upright she was headed into the wind, but the attempt was unsuccessful.

As the list gradually increased, the first pilot, believed that the tug had become fouled by the towrope and rushed to the wheel-house. On his arrival, he noticed that the barge was a normal distance astern of the tug and in line with the Île des Barques range.

The afterdeck, as well as the bulwarks on the starboard

side were submerged and the tug had a pronounced starboard list of approximately 25° - 30°. Believing that the door on the starboard side which gives access to the engine-room was open, the master rushed down to close it. It was already closed, so he quickly returned to the wheel-house. With the steering control in manual, the master tried to right the tug by turning the rudders to port and starboard while manoeuvring the port and starboard engines at different speeds but to no avail.

From the wheel-house, the second pilot saw a tow steaming out of the Saint-Francois River in Lake Saint-Pierre and knowning that one of the two tugs was the "LE PHIL D" called her on VHF channel 9. The latter answered the call and the second pilot requested that she come to their assistance. The master of the "LE PHIL D" left his tow and headed for the tug in trouble. He estimated receiving the call between 0920-0925. At about 0930, the "LE PHIL D" advised Montreal VTS Centre that the "MAGIC" and her tow had run into difficulty at buoy S111.

Afraid of being overtaken and girded by the barge, the master of the "MAGIC" left the wheel-house and went to the towing winch control and paid out the towrope freely. On his return to the wheel-house he turned the "MAGIC" to starboard and headed straight for the barge. As soon as the bow of the tug touched the barge on the starboard side, three (3) crew members and the two (2) pilots abandoned the tug and boarded the barge.

As the master and the chief engineer were about to board the barge, the "MAGIC" ran aground and the mooring lines made fast to the barge parted one after the other. The master and the chief engineer remained on board while the barge continued to drift. As the tug came in contact with the bottom she started to come upright and gradually the water on deck ran off through the freeing ports.

The first pilot who was on board the drifting barge boarded the "LE PHIL D" and requested that he be brought back to the "MAGIC" which had grounded about 180 m (600 ft) from buoy S111.

When he reboarded the "MAGIC" at 0942, the first pilot advised the Montreal VTS Centre of the grounding of the tug and barge south of buoy S111.

At 0939 VTS Montreal advised MRSC in Quebec City of the incident and at 0941 the "GC 03" departed Louiseville to render assistance to the tug in trouble.

Some time later, those who were still on the barge were returned to the "MAGIC" by the "GC 03".

After making sure that the hull of the "MAGIC" was watertight, an attempt was made to refloat her and at about 1045 the tug reported being afloat. She headed for Sorel escorted by the "GC 03" and the "GC 1205". She arrived in Sorel and berthed at section No. 7 at about 1250 on June 2, 1986.

Analysis

1. General

(a) The US tug "MAGIC" is registered in Philadelphia, was built in Houma, Louisiana, in 1966 and is owned by the Tug Magic Company in Wallingford, Pennsylvania.

(b) The US barge "CMS 1261" is registered in New Orleans, was built in Braithwaite, Louisiana, in 1979 and is owned by the General Barge Company of Louisiana.

(c) At the time of the accident on June 2, 1986, the Calore Freight Systems Company of Seekonk, Massachusetts had chartered the tug "MAGIC" and the barge "CMS 1261". The barge carried twelve (12) steel pontoons destined for San Diego, California and was towed by the tug "MAGIC".

2. Draught

At the time of the accident, the "MAGIC" had a draught of 2.29 m (7.5 ft) forward and 3.81 m (12.5 ft) aft while the barge "CMS 1261" had a draught of (5.5 ft) 1.68 m fore and aft.

3. Towing winch and towrope

The towing winch on board the tug "MAGIC" was located on the main deck, aft of the crew's quarters. There was a remote control for the winch mechanism in a house on the upper deck on the starboard side.

The barge "CMS 1261" was towed on a 3.8 cm (1.5 in) diameter and 488 m (1,600 ft) long wire rope. At the time of the accident the towrope had been set at about 45.72 m (150 ft).

4. **Draught marks**

Welded-on aft draught marks were located on each side of the hull approximately 6.1 m (20 ft) from the stern, however, the draught marks forward could not be seen from the dock probably because of 30 cm (12") steel fendering at the waterline which may have been fitted after the vessel was built and so obscured the original markings.

During an inspection at Sorel on June 3, 1986, the draught aft was found to be 3.53 m (11 ft 7 in) and according to the diver's report, the draught forward was approximately 2.74 m (9 ft).

5. **Load Line Certificate**

(a) The barge "CMS 1261" with a gross tonnage of 2,607 was in possession of a Load Line Certificate (1966) issued by the ABS classification society in New York on May 5, 1986 and was valid until October 7, 1986.

(b) The US tug "MAGIC" was not in possession of a Load Line Certificate nor was she required to have one. According to the US Coast Guard, US tugs in her trade have to be in possession of a Load Line Certificate if the gross tonnage exceeds 150 tons and the length exceeds 79 ft. In this case, the "MAGIC" was 86 ft long but her gross tonnage was 146 gt i.e. less than the 150 gross mentioned earlier.

6. **Inspection Certificate**

(a) The barge "CMS 1261" was in possession of an Inspection Certificate issued by the US Coast Guard in New Orleans on July 25, 1985 and was valid until July 25, 1987.

(b) The "MAGIC" was not in possession of a USCG Inspection Certificate nor was she required to have one by virtue of her gross tonnage being less than 300 tons.

7. **Certificate of Documentation**

The "MAGIC" as well as the barge "CMS 1261" were each in possession of a Certificate of Documentation issued by the US Coast Guard.

The date of expiry of the Certificate of Documentation for the "MAGIC" was the last day of October, 1986 and for the "CMS 1261" the last day of May, 1987.

According to the Certificates of Documentation, both vessels were documented for coastwise voyages.

8. Type of voyage

A voyage from Lake Erie to San Diego, California by way of the Gulf of St. Lawrence and the Panama Canal is deemed to be a Domestic Trade voyage by the US Coast Guard.

9. Windlass, anchor and anchor cable

During the inspection of the "MAGIC" on June 3, 1986, it was noted that the hawse pipe had been blanked off with a flush welded plate, and the master confirmed that the tug was not equipped with any anchor, chain or windlass.

According to the US Coast Guard, the "MAGIC" was not required to have an anchor by virtue of her limitation to Home Trade voyages.

10. Inspection of tug

On June 3, 1986, in Sorel, an inspection of the "MAGIC" revealed the following:

(a) At the time of the accident, the following documents were not on board:

I) general arrangement plan;
II) capacity plan;
III) piping systems plan
IV) Stability Data;
V) Tank Calibration details

b) All sounding pipes, except those to the lube oil tanks were blanked off and welded at main deck level.

c) Filling pipes 15.2 cm (6") in diameter for the ballast and oil fuel tanks were approximately 25.4 cm (10") high and located port and starboard on the main deck, at the ship's side, under the bulwark rail. These could not be used as alternatives to sounding pipes because of obstructions caused by deflector/striker plates at their lower

ends, and/or the internal hull structure.

d) The contents of the water ballast tanks could only be verified, as far as possible, when five (5) watertight access manhole covers were removed from the main deck and the tank ullages recorded.

e) The access manholes to the partially fitted Nos. 1, 2 and 3 oil fuel tanks were located in the transverse bulkheads and therefore could not be removed at this time, consequently the engineer's estimates of their contents could not be safely verified.

f) The contents of the daily service tank and potable water tank located in the engine-room were verified by using their respective sight glass and gauge marks.

11. **Estimate of liquids on board**

As a capacity plan of the tanks could not be found on board the "MAGIC", it was necessary to estimate the contents and the following estimates were made of the liquids in the tanks at the time of the accident:

Fore peak	empty
No. 1 diesel oil tank	partially filled with 3,400 US gal of diesel oil
No. 1 ballast tank	half full
Forward lube oil tank	400 US gal
No. 2 port diesel oil tank	half full with 3,000 US gal of diesel oil
No. 2 starboard diesel oil tank	half full with 3,000 US gal of diesel oil
Daily service tank	950 US gal
Potable water tank	half full
Engine-room bilges	19" of oily mixture
No. 3 port diesel oil tank	3/4 full with 5,000 US gal

No. 3 starboard diesel tank	3/4 full with 5,000 US gal
No. 2 ballast tank	half full
After lube oil tank	half full 300 US gal
Ballast tank No. 3	3/4 full
After peak	3/4 full

The fore peak and the No. 1 ballast tank were completely filled with water ballast after the tug was refloated on June 2, 1986 prior to proceeding to Sorel.

12. **Diesel oil shift due to the list**

Before the accident the oil fuel cross-flooding connection pipes between No. 3 port and starboard, and No. 2 port and starboard oil fuel tanks were normally open to ensure even transfer to the daily service tank; therefore once the heel developed, oil fuel gravitated to the starboard side, increasing the heeling moment.

Following the incident on June 2, 1986, the valves on these cross-flooding connection pipes were shut down before returning to Sorel.

13. **Stability Information**

Although the owners were beyond Canadian jurisdiction, they voluntarily supplied what basic design and construction details they had. However, due to the incompleteness of the records of the owners and the builders, the information forwarded was insufficient to allow an evaluation to be made of the vessel's stability at the time of the casualty.

14. **Transverse stability**

Once the starboard heel had been induced by the tug yawing in the rough sea and/or by water shipped on the open afterdeck and starboard side, the angle of heel continued to increase because of:

(a) the reduced intact transverse stability due to the free surface effect in the thirteen (13) slack tanks and the water shipped and not cleared off the afterdeck and starboard side;

(b) the increasing heeling moment due to the shift of all loose liquids in the thirteen (13) slack tanks, and water shipped on the afterdeck and starboard side, and the gravitation of diesel oil from the port to the starboard side fuel tanks; and

(c) the progressive reduction of the vessel's initial and dynamic transverse stability characteristics due to the increasing free surface effect and heeling moments as the vessel continued to heel to starboard.

15. Previous indications of tenderness

Several members of the crew indicated that before the accident the "MAGIC" was quite tender and that she usually heeled appreciably when turning at moderate speed without any tow, and that the afterdeck was always wet with shipped water taken through the freeing ports because of the low after freeboard. The master estimated the freeboard to have been 10 cm (4") in Saint Lambert Lock.

During the inspection in Sorel, on June 3, 1986, the freeboard was determined to be about 30 cm (12") but a certain amount of ballast had been discharged from the after tanks following the grounding.

16. Freeing ports

There were six (6) freeing ports in the bulwarks on the main deck on each side of the tug. They were all located aft of amidships, with three (3) on each side in way of the house sides, and three (3) port and starboard in way of the open afterdeck. Each one was 27" long and 5" high producing a total surface area of 5.67 ft^2 for each side of the bulwarks.

As a standard for comparison, the Canadian Hull Construction Regulations which are applicable to ships built or converted for the purpose of towing were consulted. They stipulate in part:

> 139(2)... the minimum number of square feet in the total area of freeing ports on each side of a well on a ship shall be determined by dividing the number of feet in length of that well by four.

Were this rule applied to a Canadian tug with wells and

bulwarks similar in length to those of the "MAGIC", the required total surface area in square feet for the freeing ports on each side would have been 21.5 ft².

17. **Bulwarks and freeboard**

The height of the bulwarks on the main deck was 68.5 cm (27") from the stern to abreast of the towing winch and then gradually increased up to a height of 122 cm (48") at the stem.

At the time of the inspection in Sorel on June 3, 1986, the freeboard from the top of the bulwark was 284.5 cm (112") at the stem and 99 cm (39") in way of the after draught marks, i.e. approximately 30.5 cm (12") to the main deck.

Due to the small freeboard in the vicinity of the open afterdeck, a list of about 4° would cause the deck edge to immerse.

18. **No damage to the hull**

Following an underwater inspection, divers reported no apparent damage to the hull of the "MAGIC".

19. **Pilotage of the tug "MAGIC"**

Due to her length being less than 40.68 m (100 ft), the "MAGIC" was not subject to compulsory pilotage. However, barge "CMS 1261" being longer than 40.68 m and towed by the "MAGIC" made it compulsory for the latter to be piloted by a licensed pilot as far as the eastern limit of the compulsory pilotage area.

At the time of the near-capsizing, there were two pilots on board the tug. Following the abandonment of the tug, one pilot, i.e. the first one, reboarded the tug in order to assist the master in refloating the grounded tug and to carry out radio communications and conduct her to Sorel.

The "MAGIC" was refloated and brought to Sorel at about 1250 on June 2, 1986. The barge "CMS 1261" was re-floated two days later, i.e on June 4, at about 1915 and also moored in Sorel.

Following the near-capsizing of the "MAGIC", Les Pilotes du Saint-Laurent Central Inc. along with La Corporation des Pilotes du Bas Saint-Laurent refused to pilot the

tug until her seaworthiness could be confirmed by Canadian or US authorities.

Not having been given this confirmation by the authorities, Les Pilotes du Saint-Laurent Central Inc. proposed to the charterer that a Canadian tug be assigned to tow the barge "CMS 1261" to the eastern limit of the compulsory pilotage area.

A Canadian tug was assigned and at 1825 on June 5, 1986, the barge "CMS 1261" left Sorel and headed downriver towed by the tug "ROBERT H" and followed by the tug "MAGIC".

On arrival at the pilot station at Les Escoumins at 2020 on June 6, 1986, the "ROBERT H" handed the tow over to the "MAGIC" for the remainder of the voyage.

20. Weather conditions

At the time of the accident, the visibility was good, the wind was from the north-north-east at 20 knots and the air temperature was 6°C (43°F). The sea was moderate with waves estimated at 1.5 m (5 ft) and the water level relative to the chart datum was at 1.8 m (5.9 ft) and dropping.

21. Assistance to the tug "MAGIC"

The Canadian tug "LE PHIL D" which was towing a dredge and two barges with the help of another tug, responded to the call on channel 9 from the "MAGIC". She was the first to arrive on the scene and to advise Montreal VTS Centre that the "MAGIC" was in difficulty at buoy S111.

She was later joined by the "GC 03", the "GC 1205" and the tugs "ROXANNE D" and "OMNI RICHELIEU".

Following the refloating of the "MAGIC", an attempt was made to refloat the barge but without success. The latter was refloated at 1640 on June 4.

22. Qualifications and experience of personnel

(a) The master has been at sea for 14 years including 3 years on board tugs. He holds a US certificate of competency as Master of a Steamship of less than 500 tons gross issued in 1983 and valid for a period of 5 years. He has been working for Calore Freight Systems since December 1985. He had been

master of the "MAGIC" since May 20, 1986. On June 3, 1986, he was replaced by another master in Sorel.

(b) The chief engineer has been at sea for 7 years on board supply vessels and tugs in the capacities of seaman or engineer. He had previously worked on board the "MAGIC" for a period of one year. He rejoined the "MAGIC" at Prescott on June 1, 1986 and was replaced by another engineer in Sorel on June 3, 1986. By reason of her tonnage, the tug "MAGIC" was not required to have a licensed engineer.

Findings

It would appear that the near-capsizing of the US tug "MAGIC", whilst under way in the St. Lawrence River, at the entrance to Lake Saint-Pierre, was caused by the following factors.

- water was first shipped on the open afterdeck on the starboard side causing an initial list which was aggravated when the water trapped against the bulwarks could not be cleared through the freeing ports which probably were already submerged due to the low freeboard;

- due to the list, the liquid contents in the 13 slack tanks flowed to starboard, further increasing the heeling moment;

- due to open cross-flooding connection valves between the port fuel tanks and the starboard fuel tanks, oil fuel shifted by gravity to the starboard side thereby increasing the list to starboard;

- due to the free surface effects of the 13 slack water ballast and oil fuel tanks, and the loose bilge water in the engine-room, the transverse stability was reduced, and

- the water shipped and trapped against the starboard bulwarks produced a free surface effect and increased the heeling moment.

Other Findings

It was not possible to verify the stability of the "MAGIC" because of the incompleteness of the necessary

information, nor was such information required by U.S. Government statute.

The grounding of the "MAGIC" probably prevented her from capsizing.

The deck edge of the "MAGIC" was easily immersed by a slight list because of the low free board.

The small surface area of the freeing ports delayed the clearing of water previously shipped on the afterdeck.

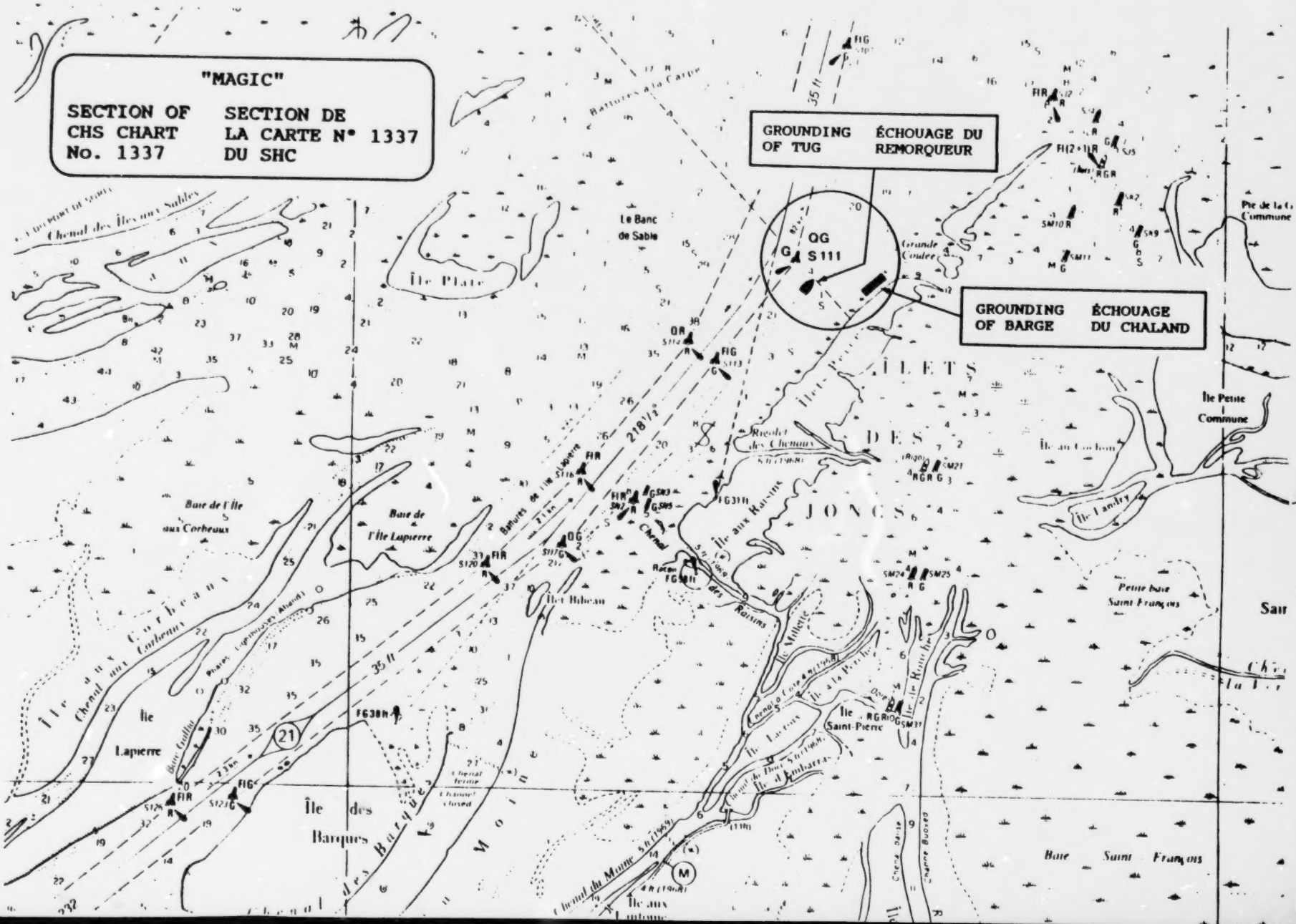
The pilots' decision following the incident on June 2, 1986, in refusing to pilot the "MAGIC" until she was inspected by Canadian or US authorities was prudent and justifiable.

It was not possible to accurately assess the contents of most of the tanks aboard as the sounding pipes had been blanked off.

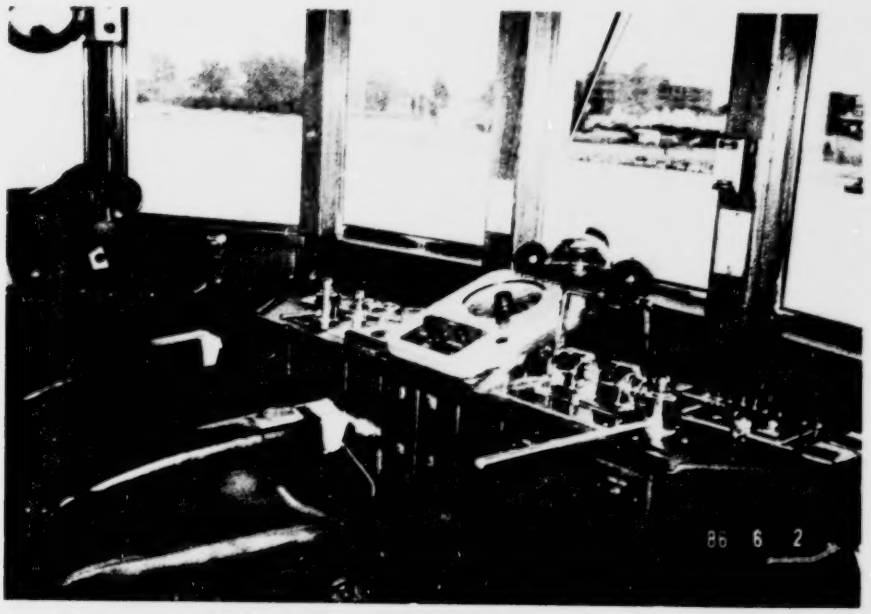
OTTAWA, ONTARIO
APRIL, 1987.

Glossary

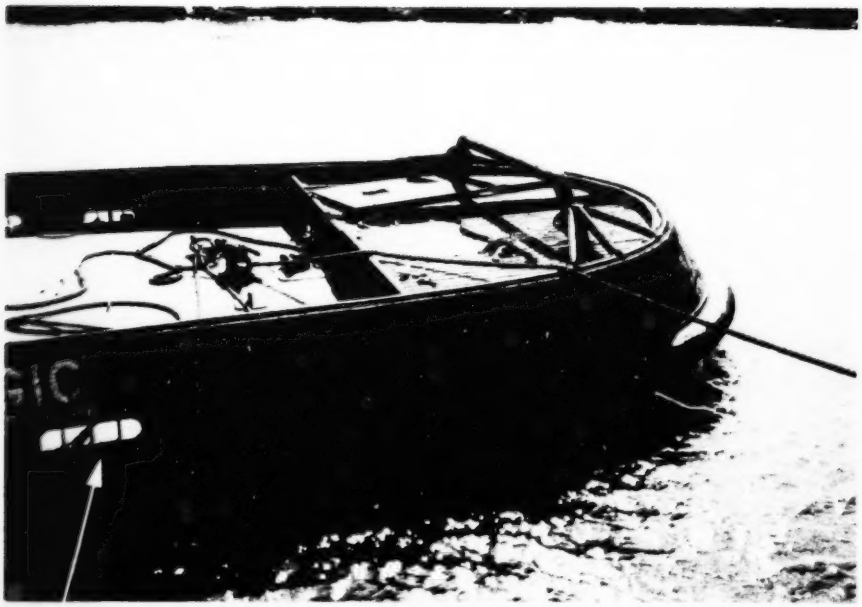
ABS	American Bureau of Shipping
Freeboard	The vertical distance measured at the vessel's side amidships from the load water line to the upper side of the freeboard deck
Free Surface Effect	When a body of liquid has an unconfined upper surface which is free to move, the meta-centric height is reduced due to an increase in the centre of gravity of the vessel
MRSC	Marine Rescue Sub Centre
Metacentric Height	The vertical distance between the center of gravity and the metacenter; it is a measure of stability
Transverse stability	Ability of a vessel to right herself when she is inclined by an external force
VHF	Very high frequency
VTS	Vessel Traffic Service


"MAGIC"
SECTION OF CHS CHART No. 1337
SECTION DE LA CARTE N° 1337 DU SHC
GROUNDING OF TUG
ÉCHOUAGE DU REMORQUEUR
GROUNDING OF BARGE
ÉCHOUAGE DU CHALAND
QG S111
Le Banc de Sable
Île Plate
Chenal des Îles aux Sables
Baie de l'Île aux Corbeaux
Baie de l'Île Lapierre
Île aux Corbeaux
Île Lapierre
Îlet Bibeau
Île aux Raisins
Îlet Petite Commune
Île Petite Commune
Îlet Landry
Île Saint-Pierre
Île des Barques
Baie Saint-François
Petite baie Saint-François
ÎLETS DES JONCS
218 Vz
35 ft

The U.S. tug "MAGIC".
Le remorqueur américain "MAGIC".



Wheel-house of the "MAGIC".
La timonerie du remorqueur "MAGIC".



Freeing ports on the "MAGIC".
Sabords de décharge sur le "MAGIC".

The barge "CMS 1261".
Le chaland "CMS 1261".